

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~strikethrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please CANCEL claims, AMEND claims, and ADD new claims, in accordance with the following:

1. (CANCELED)

2. (CURRENTLY AMENDED) ~~The control device for the semiconductor memory device according to claim 1, further comprising:~~

A control device for a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

a request receiving circuit receiving a request access to the semiconductor memory device;

a determining circuit determining whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device based on the access request received by the request receiving circuit;

an instruction outputting circuit supplying the access instruction for enabling the auto precharge function or the access instruction for disabling the auto precharge function to the semiconductor memory device in accordance with a result of the determination by the determining circuit; and

an area setting circuit in which address information showing an area in the semiconductor memory is set, wherein;

the access request includes access address information on an address in the semiconductor memory device to be accessed, and

wherein the determining circuit determines whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device by comparing the address information set in the area setting circuit and the access address information of the access request received by the request receiving circuit.

3. (CURRENTLY AMENDED) The control device for the semiconductor memory device according to claim 2, wherein:

in the area setting circuit, address information₁ showing an area in the semiconductor memory device to be accessed by the access instruction for enabling the auto precharge function₁ is set; and

wherein the determining circuit determines that the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device when the access address information of the access request received by the request receiving circuit is included in the address information set in the area setting circuit.

A₁
4. (CURRENTLY AMENDED) The control device for the semiconductor memory device according to claim 2, wherein:

in the area setting circuit, address information₁ showing an area in the semiconductor memory device to be accessed by the access instruction for disabling the auto precharge function₁ is set; and

wherein the determining circuit determines that the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device when the access address information of the access request received by the request receiving circuit and the address information set in the area setting circuit are different.

5. (CURRENTLY AMENDED) The control device for the semiconductor memory device according to claim 2, wherein:

the area setting circuit is a register in which a setting is changeable from the outside.

6. (CURRENTLY AMENDED) ~~The control device for the semiconductor memory device according to claim 1,~~ A control device for a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

a request receiving circuit receiving a request access to the semiconductor memory device;

a determining circuit determining whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device based on the access request received by the request receiving circuit; and

an instruction outputting circuit supplying the access instruction for enabling the auto

precharge function or the access instruction for disabling the auto precharge function to the semiconductor memory device in accordance with a result of the determination by the determining circuit, wherein;

the request receiving circuit receives a signal indicating an access type with the access request, and

~~wherein~~ the determining circuit determines whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device according to the signal indicating the access type received by the request receiving circuit.

A1 7. (CURRENTLY AMENDED) The control device for the semiconductor memory according to claim 6, wherein:

the signal indicating the access type is a signal indicating sequential access in which sequential areas₁ in the semiconductor memory device are accessed₁ or random access₁ in which random areas in the semiconductor memory device are accessed₁; and

~~wherein~~ the determining circuit determines that the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device when random access is indicated by the signal indicating the access type which is received by the request receiving circuit.

8. (CURRENTLY AMENDED) ~~The control device for the semiconductor memory device according to claim 1,~~

wherein A control device for a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising:

a request receiving circuit receiving a request access to the semiconductor memory device, the access request includes including data size information showing a quantity of data to be transferred₁;

~~the control device for the semiconductor memory device, further comprising:~~

a determining circuit determining whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device based on the access request received by the request receiving circuit;

an instruction outputting circuit supplying the access instruction for enabling the auto precharge function or the access instruction for disabling the auto precharge function to the

semiconductor memory device in accordance with a result of the determination by the determining circuit;

a transfer number computing circuit ~~for~~ computing a number of times of access to the semiconductor memory device based on the data size information of the access request received by the request receiving circuit; and

~~wherein~~ the determining circuit ~~determines~~ determining whether or not the access instruction, ~~for~~ enabling the auto precharge function, is supplied to the semiconductor memory device based on the number of times of access computed by the transfer number computing circuit.

A, 9. (CURRENTLY AMENDED) The control device for the semiconductor memory device according to claim 8, wherein:

the transfer number computing circuit includes a counter circuit ~~for~~ counting the number of times of access to the semiconductor memory device; and

~~wherein~~ the determining circuit determines whether or not the access instruction, ~~for~~ enabling the auto precharge function, is supplied to the semiconductor memory device according to a value counted by the counter circuit.

10. (CURRENTLY AMENDED) The control device for the semiconductor memory device according to claim 9, wherein:

each time an access instruction is outputted from the instruction outputting circuit to the semiconductor memory device, the counter circuit decrements a count value by one with the number of times of access to the semiconductor memory device computed based on the data size information of the access request received by the request receiving circuit as an initial value; and

~~wherein~~ the determining circuit determines that the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device when the value counted by the counter circuit is one.

11. (CURRENTLY AMENDED) ~~The control device for the semiconductor memory device according to claim 1,~~

~~wherein the request receiving circuit receives requests for access to the semiconductor memory device~~ A control device for a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access

instruction, comprising:

a request receiving circuit receiving a request access to the semiconductor memory device outputted respectively from a plurality of master circuits, and

wherein a determining circuit determining whether or not the access instruction, enabling the auto precharge function is supplied to the semiconductor memory device based on the access request received by the request receiving circuit;

an instruction outputting circuit supplying the access instruction for enabling the auto precharge function or the access instruction for disabling the auto precharge function to the semiconductor memory device in accordance with a result of the determination by the determining circuit; and

the determining circuit determines whether or not the access instruction, for enabling the auto precharge function, is supplied to the semiconductor memory device depending on the master circuits which outputted the access requests received by the request receiving circuit.

12. (CURRENTLY AMENDED) The control device for the semiconductor memory device according to claim 11, further comprising:

a master setting circuit in which a master circuit, for supplying the access instruction for enabling the auto precharge function in response to the access request received by the request receiving circuit, is set.

13. (CURRENTLY AMENDED) The control device for the semiconductor memory device according to claim 12, wherein:

the master setting circuit is a register in which a setting is changeable from the outside.

14. (CURRENTLY AMENDED) The control device for the semiconductor memory device according to claim 12, wherein:

the master setting circuit is allowed to set whether or not the access instruction, for enabling the auto precharge function, is supplied to the semiconductor memory device in response to the respective access requests from the plurality of master circuits received by the request receiving circuit.

15. (CURRENTLY AMENDED) ~~The control device for the semiconductor memory device according to claim 1, further comprising:~~

A control device for a semiconductor memory device having an auto precharge function

of automatically performing a precharge operation in accordance with an access instruction, comprising:

a request receiving circuit receiving a request access to the semiconductor memory device;

a determining circuit determining whether or not the access instruction, enabling the auto precharge function, is supplied to the semiconductor memory device based on the access request received by the request receiving circuit;

an instruction outputting circuit supplying the access instruction, enabling the auto precharge function, or the access instruction, disabling the auto precharge function to the semiconductor memory device, in accordance with a result of the determination by the determining circuit;

A₁ a prefetch controlling circuit for reading data in an area specified by the access request and, in addition, data in sequential areas subsequent to the specified area when the access request received by the request receiving circuit is a read access request; and

wherein the determining circuit determines determining that the access instruction₁ for disabling the auto precharge function₁ is supplied to the semiconductor memory circuit when the access request received by the request receiving circuit is the read access request.

16. (CURRENTLY AMENDED) A method of controlling a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising the steps of:

receiving a request for access to the semiconductor memory device;

determining whether or not the access instruction₁ for enabling the auto precharge function is supplied to the semiconductor memory device₁ based on the received access request; and

supplying the access instruction₁ for enabling the auto precharge function₁ or the access instruction₁ for disabling the auto precharge function to the semiconductor memory device₁ in accordance with a result of the determination.

17. (CURRENTLY AMENDED) The method of controlling the semiconductor memory device according to claim 16, wherein:

the access request includes access address information on an address in the semiconductor memory device to be accessed; and

wherein in the determining₁ of whether or not the access instruction for enabling the auto

precharge function is supplied to the semiconductor memory device, ~~the determination~~ is performed by comparing the address information showing an area set in the semiconductor memory device and the received access address information of the access request.

18. (CURRENTLY AMENDED) The method of controlling the semiconductor memory device according to claim 17, wherein:

the address information is address information showing an area in the semiconductor memory device to be accessed by the access instruction ~~for~~ enabling the auto precharge function; and

~~wherein in the determining, of whether or not the access instruction, for enabling the auto precharge function, it is determined~~ determines that the access instruction, ~~for~~ enabling the auto precharge function, is supplied to the semiconductor memory device when the set address information matches the received access address information of the access request.

19. (CURRENTLY AMENDED) The method of controlling the semiconductor memory device according to claim 16, further comprising ~~the step of:~~

receiving a signal indicating an access type with the access request,

~~wherein in the determining, of whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory circuit, and of whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device, is determined in accordance with the received signal indicating the access type.~~

20. (CURRENTLY AMENDED) The method of controlling the semiconductor memory device according to claim 19, wherein:

the signal indicating the access type is a signal indicating sequential access, in which sequential areas in the semiconductor memory device are accessed, or random access, in which random areas in the semiconductor memory device are accessed; and

~~wherein in the determining, of whether or not the access instruction, for enabling the auto precharge function, is supplied to the semiconductor memory device, it is determined~~ determines that the access instruction, ~~for~~ enabling the auto precharge function, is supplied to the semiconductor memory device when random access is indicated by the received signal indicating the access type.

21. (CURRENTLY AMENDED) The method of controlling the semiconductor memory

device according to claim 16, wherein:

a prefetch function₁ to read data in an area specified by the access request and, in addition, data in sequential areas subsequent to the specified area₁ is provided when the received access request is a read access request₁; and

wherein in the determining of whether or not the access instruction₁ for enabling the auto precharge function₁ is supplied to the semiconductor memory device, ~~it is determined~~ determines that the access instruction₁ for disabling the auto precharge₁ is supplied to the semiconductor memory device when the received access request is the read access request.

A1 22. (CURRENTLY AMENDED) A method of controlling a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising ~~the steps of~~:

receiving a request for access to the semiconductor memory device having data size information showing a quantity of data to be transferred;

computing a number of times of access to the semiconductor memory device based on the data size information of the received access request;

determining whether or not the access instruction for enabling the auto precharge function is supplied to the semiconductor memory device₁ based on the computed number of times of access; and

supplying the access instruction for enabling the auto precharge function or the access instruction for disabling the auto precharge function to the semiconductor memory device in accordance with a result of the determination.

23. (CURRENTLY AMENDED) A method of controlling a semiconductor memory device having an auto precharge function of automatically performing a precharge operation in accordance with an access instruction, comprising ~~the steps of~~:

receiving a request for access to the semiconductor memory device outputted from any one of a plurality of master circuits;

determining whether or not the access instruction₁ for enabling the auto precharge function₁ is supplied to the semiconductor memory device in accordance with the master circuit which outputs the received access request; and

supplying the access instruction₁ for enabling the auto precharge function₁ or the access instruction₁ for disabling the auto precharge function₁ to the semiconductor memory device in accordance with a result of the determination.